Claims

1. Injection valve with capacitive valve lift sensor for internal combustion engines, with a valve seat (4) and movable valve parts, which include a closing element guided longitudinally and assigned to the valve seat (4), said closing element being guided in an electrically insulated fashion, the closing element and the valve seat (4) each forming the electrodes of a capacitor connected in an electric circuit, the capacity of said capacitor changing with the valve lift of the closing element, characterized in that
an electrically conductive injector body (14) connected to the electric circuit is provided, on which a nozzle body (2) is configured with a valve seat (4) and the closing element is configured as a valve needle (5), which is connected to the electric circuit by its end surface facing away from the valve and opposite the valve seat (4).

2. Injection valve according to Claim 1,
characterized in that the voltage interface of the electric circuit is achieved via a conductor (16) passed in an insulated fashion in an axial hole (19) in the injector body (14), said conductor (16) being connected to an electrically conductive contact spring (17) arranged in an insulated fashion in the injector body (14), said contact spring (17) being supported in a manner such that contact is established on the bottom of the head of a conductive injector piston (9), which is pressed in a manner such that contact is established against the end surface of the valve needle (5) facing away from the valve.

3. Injection valve according to Claim 1 or 2, characterized in that the injector body (14) is configured as an intermediate disk (6) above the end surface of the valve needle (5) facing

away from the valve and an electrically conductive contact element (18) is provided on the side of the intermediate disk (6) facing away from the valve for an electrical connection between the conductor (16) and the contact spring (17), said contact element (18) being electrically insulated from the injector body (14) and the intermediate disk (6) and on which the valve-side end of the contact spring (17) is supported.

4. Injection valve according to Claim 2 or 3, characterized in that a seal (20) is provided at the start and end of the axial hole (19).

5. Injection valve according to Claim 1, characterized in that the electric circuit passes via a nozzle retaining spring (8) arranged in an electrically insulated fashion in the injector body (14), said nozzle retaining spring (8) pressing the valve needle (5) against the valve seat (4), the end of the nozzle retaining spring (8) facing away from the valve being supported on an adjusting disk (10), which is connected electrically to a terminal (11) with further connections, and being supported on the valve side on a conductive injector piston (9), which is pressed in a manner such that contact is established against the end surface of the valve needle (5) facing away from the valve.

6. Injection valve according to one of Claims 2 to 5, characterized in that the valve needle (5) and the injector piston (9) have an insulating layer at least on part of the surfaces that do not serve to establish contact.

7. Injection valve according to Claim 5 or 6, characterized in that a control piston (12) is provided, which presses with its valve-side end surface on the central region

of the head surface of the injector piston (9) facing away from the valve and an insulating layer is provided on the head surface of the lift adjustment pin (9).

8. Injection valve according to one of the preceding claims, characterized in that the injector body (14) is configured as an intermediate disk (6) above the end surface of the valve needle (5) facing away from the valve and an axial annular collar is configured on the end surface of the valve needle (5), to which a counter-collar configured on the bottom of the intermediate disk (6) is assigned as a stop surface, the bottom of the intermediate disk (6) being provided with an insulating layer at least in the area of the stop surface.

9. Injection valve according to one of Claims 6 to 8, characterized in that the electrically insulating layer is configured as a diamond-like carbon (DLC) or aluminum oxide or zircon oxynitrite layer.

10. Injection valve according to one of the preceding claims, characterized in that the valve lift (H) present can be determined by measuring the voltage drop U_{inj} in each instance at the complex resistance (R_2 + C_{var}), an alternating voltage being applied as the operating voltage U_B and the complex resistance being formed essentially between the nozzle needle and the nozzle body.

11. Injection valve according to one of the preceding claims, characterized in that in the axial position of the nozzle needle (5) is a function of the determined capacity (C_{var}) and resistance (R_2) between the injector body (14) and at least one valve part (5, 6, 9, 12).

12. Injection valve according to Claim 10 or 11, characterized in that the time when the nozzle needle lifts off the valve seat is a function of the change in capacity determined between the nozzle needle and the nozzle body and can in particular be detected by the determined capacity reduction.

13. Injection valve according to one of the preceding claims, characterized in that the wear rate of the insulating layer between the nozzle needle and the nozzle body is a function of the ohmic resistance (R_2) determined between the nozzle needle (5) and nozzle body (2) and a reduced resistance (R_2) is preferably associated with increased wear.

14. Injection valve according to one of the preceding claims, characterized in that the inside of the nozzle body (2) and the nozzle needle (5) are coated at least in the region of the valve seat (4).